Fisheries and Oceans Canada | Pêches et Océans Canada
Science | Sciences
Maritimes Region
Canadian Science Advisory Secretariat
Science Response 2012/011

SCALLOP FISHERY AREA/TIME CLOSURE TO PROTECT COD SPAWNING AGGREGATIONS IN 5Z (GEORGES BANK)

Context

All fishing mortality of Georges Bank cod (*Gadus morhua*) in Canada is required to be accounted for, and efforts to reduce cod bycatch in the offshore scallop fishery are ongoing. In order to reduce bycatch and minimize disturbance to spawning aggregations of cod by the offshore scallop fishery on Georges Bank, DFO has implemented area/time closures from early February to the end of March since 2005. To assist resource managers in determining appropriate area closures for the offshore scallop fishery on Georges Bank during the cod spawning seasons, fisheries management asked the following question: "What does a review of 5Z cod distribution, particularly at spawning time, reveal about the spatial and temporal trends of the species and its overlap with the offshore scallop fishery? Highlight areas of high 5Z cod distribution using the cells which have already been defined and used in previous years." This document provides the requested information on the spatial distribution of cod abundance and its overlap with scallop catches on Georges Bank. It concludes that implementing a cod area/time closure for 2012 with a similar location as the cod area/time closure of 2011 should achieve the objective of reducing cod bycatch and disturbance of spawning aggregations, although it may not fully reflect current cod distribution.

This Science Response Report results from the Science Special Response Process of February 2012 to provide an Update for Scallop Fishery Area/Time Closure to Reduce Cod By-catch on Georges Bank in 2012, which was conducted by email. It is an update of information provided annually from 2006 to 2009 in the Maritimes Region's Expert Opinions series and from 2010 onward in the CSAS Science Response report series.

Analysis and Response

The 2011 first quarter offshore scallop catches on Georges Bank correspond to 10% (450 tonnes of meats) of the total allowable catch for the year, which is below the long term average percentage for the first quarter (18% since 1990). At the start of the 2011 fishery, there were two industry managed scallop seed closure areas in place, outlined in red in Figures 1 and 2. These closures were lifted on April 12, 2011.

The analysis used to provide this information has been updated with the 2011 cod abundance data, obtained from the annual DFO Research Vessel (RV) survey, and scallop catches from the offshore scallop fishery. Details on the methods for this analysis can be found in the Maritimes Region Science Expert Opinion 2006 (DFO, 2006). Information from the DFO RV survey conducted during late February/early March was used to identify areas of high aggregations of adult (age 3+) cod. The distribution of age 3+ cod was plotted on a 5-minute longitude by 3.33-minute latitude cells (17 nautical miles^2 or 55 kms^2 per cell). The number of cod per cell was determined as the average number for all RV survey tows within a cell. Two scenarios were examined: 1) using data from the last 10-year period (2002-2011) and 2) using all available data (1996-2011, 16-year period).

Under Scenario 1, the high cod aggregation areas for the last decade (Figure 1. Cells with greater than 50 age 3+ cod, numbered 1 to 14 in order of decreasing abundance) were compared to 2011 first quarter scallop catches in those areas (Table 1). Under Scenario 2, the high cod aggregation areas for the last 16 years (Figure 2. Cells with greater than 50 3+ cod, numbered 1 to 17 in order of decreasing abundance) were compared to 2011 first quarter scallop catches in those areas (Table 2).

Scenario 1 (Figure 1) shows general continuity in the location of high ranking cells with the 10 year scenario from the 2011 analysis (DFO, 2012), with a notable reduction in the number of cells with greater than 50 3+ cod from 16 cells in the 2011 analysis to 14 cells in the current year. The top 14 high ranking cells are in the same location as the previous year's analysis, although the order has changed (Figure 1; DFO, 2012). The highest ranked cells for 3+ cod abundance are now more dispersed throughout the fishing bank with an aggregation of 7 cells located toward the center of the bank. The top two highest ranking cells from the 2011 analysis are also the highest cells in the current year's analysis (Figure 1; DFO, 2012).

Scenario 2 cell locations included in the highest ranking for age 3+ cod abundance are the same as those observed in the analysis conducted in 2011 for cells 1 through 7 (Figure 2, DFO, 2012). The ranking order varies slightly from the previous year's analysis (Figure 2; DFO, 2012). This scenario has shown stability from year to year as current data is added. Scenario 2 continues to show an aggregation of age 3+ cod in the center of the bank with high ranking cells generally grouped together (11 cells total, Figure 2).

The closure area for the past six years has covered a similar geographical area and encompassed a cluster of cells. When comparing the two scenarios for the 2012 closure (Figures 1 and 2), the strongest aggregation of cod for both scenarios occurs in an area near the center of the bank; however, the shorter scenario (Figure 1) indicates that there are also noteworthy aggregations of 3+ cod on the northern part of the bank (cells 3 and 4, Figure 1). Although there are annual variations in the distribution of the 3+ cod abundance and aggregations have been consistently observed in the area near the center of the bank, in all scenarios presented in this document, the highest ranking cells from the two scenarios are beginning to diverge. The longer time series presented in scenario 2 may no longer reflect the current cod distribution on Georges Bank.

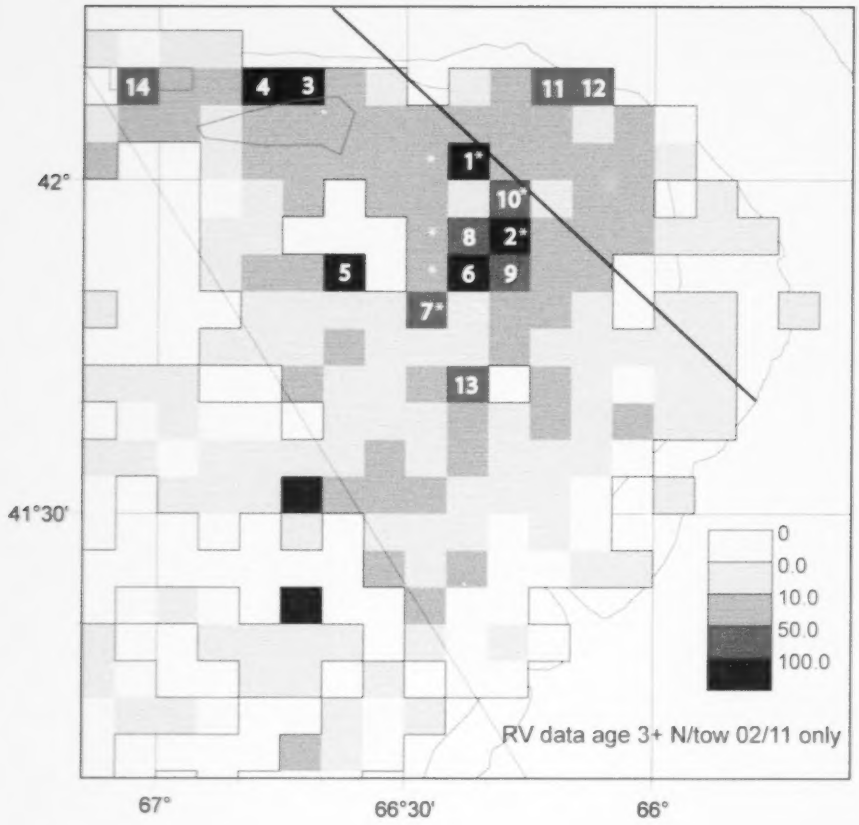

*Figure 1. Scenario 1 - Distribution of aggregated age 3+ cod from RV data for the period of 2002 to 2011. Cells on the Canadian side with 50+ adult cod per cell have been ranked in descending order. The scallop seed closures which were in effect until April 2011 are outlined in red. * indicates cells that were part of the 2011 cod closure.*

Table 1. Scenario 1 - Association between first quarter scallop catch (tonnes of meats) by the offshore scallop fleet and cells of high cod density (cells with 50 or more age 3+ cod on average in Feb.-Mar. RV survey data). The cod cells, numbered 1 to 14, are in descending order of cod abundance. Grey scale rankings indicate the abundance of scallop catch that corresponds to each cell of high cod density.

Year/Cod cell no.	1*	2*	3	4	5	6	7*	8	9	10*	11	12	13	14
2002														
2003														
2004														
2005														
2006														
2007														
2008														
2009														
2010														
2011														

** indicates cells that were part of the 2011 closure (Note: closure included 3 cells that are not represented here)*

Legend: Scallop Catch

Color	Scallop Catch (t of meats)
	catch = 50
	25 = catch < 50
	10 = catch < 25
	0 < catch < 10
	catch = 0

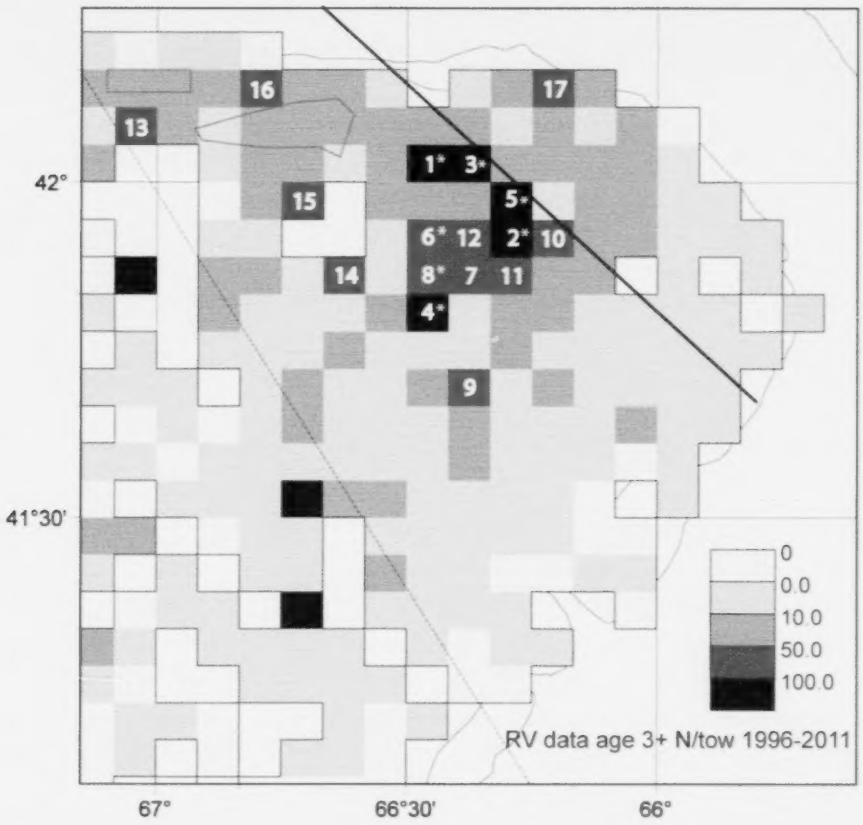

*Figure 2. Scenario 2 - Distribution of aggregated age 3+ cod from RV data for the period of 1996 to 2011. Cells on the Canadian side with 50+ adult cod per cell have been ranked in descending order. The scallop seed closures which were in effect until April 2011 are outlined in red. * indicates cells that were part of the 2011 cod closure.*

Table 2. Scenario 2 - Association between first quarter scallop catch (tonnes of meats) by the offshore scallop fleet and cells of high cod density (cells with 50 or more age 3+ cod on average in Feb.-Mar. RV survey data). The cod cells, numbered 1 to 17, are in descending order of cod abundance. Grey scale rankings indicate the abundance of scallop catch that corresponds to each cell of high cod density.

Year/Cod cell no.	1*	2*	3*	4*	5*	6*	7	8*	9	10	11	12	13	14	15	16	17
1996																	
1997																	
1998																	
1999																	
2000																	
2001																	
2002																	
2003																	
2004																	
2005																	
2006																	
2007																	
2008																	
2009																	
2010																	
2011																	

** indicates cells that were part of the 2011 closure*

Legend: Scallop Catch

Color	Scallop Catch (t of meats)
	catch = 50
	25 = catch < 50
	10 = catch < 25
	0 < catch < 10
	catch = 0

Conclusions

Implementing a cod area/time closure for 2012 with a similar location as the cod area/time closure of 2011 (selection of scenario 2) should achieve the objective of reducing cod bycatch and disturbance of spawning aggregations, although it may not fully reflect current cod distribution. A similar closure would also have a relatively low impact on the offshore scallop fishery, but this may be due in part to cod area/time closures in the past few years during the first quarter, dispersing the scallop fishery effort to other locations. The 2011 first quarter scallop landings in the 6 highest ranked cells were 17.25 t and 10.45 t for scenarios 1 and 2, respectively.

The addition of the 2011 cod data to the existing dataset changed the cell rankings in scenario 1 when compared to the previous year's analysis, although the two highest cells are the same. For scenario 1, the cluster of cells in the center of the bank contains only three of the six highest ranking cells. Three of the cells in this cluster that were closed in 2011 are no longer ranked. Three of the highest six cells (cells 3, 4, and 5) outside of this cluster had less than 1 t of scallop landings each for the first quarter of 2011 (0.35, 0.71 and 0 t, respectively; Figure 1, Table 1), also suggesting a low impact on the offshore scallop fishery if they were selected for closure.

Contributors

Alan Reeves	DFO Maritimes Region, Science Branch
Amy Glass	DFO Maritimes Region, Science Branch
Lou Van Eeckhaute	DFO Maritimes Region, Science Branch
Jessica Sameoto	DFO Maritimes Region, Science Branch

Approved by

Alain Vézina
Regional Director of Science, DFO Maritimes Region
Dartmouth, NS
Ph. 902-426-3490

Date: 27 January 2012

Sources of Information

DFO. 2006. Science Expert Opinion on Scallop Fishery Area/Time Close - 2006. Mar. Reg. Expert Opin. 2006/05.

DFO. 2012. Scallop Fishery Area/Time Closure to Protect Cod Spawning Aggregations in 5Z (Georges Bank) in 2011. DFO Can. Sci. Advis. Sec. Sci. Resp. 2011/014.

This Report is Available from the

Center for Science Advice (CSA)
Maritimes Region
Fisheries and Oceans Canada
P.O. Box 1006, Stn. B203
Dartmouth, Nova Scotia
Canada B2Y 4A2

Telephone: 902-426-7070
Fax: 902-426-5435
E-Mail: XMARMRAP@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas

ISSN 1919-3750 (Print)
ISSN 1919-3769 (Online)

La version française est disponible à l'adresse ci-dessus.

Correct Citation for this Publication

DFO. 2012. Scallop Fishery Area/Time Closure to Protect Cod Spawning Aggregations in 5Z (Georges Bank). DFO Can. Sci. Advis. Sec. Sci. Resp. 2012/011.